Autonomous Technologies for Marine Ecosystem Assessments

NOAA FISHERIES
Office of Science and Technology

Elizabeth Clarke[1,2] and William Michaels[1]
[1]NOAA/NMFS Office of Science & Technology
[2]NOAA/NMFS Northwest Fisheries Science Center
Elizabeth.Clarke@noaa.gov
Willliam.Michaels@noaa.gov

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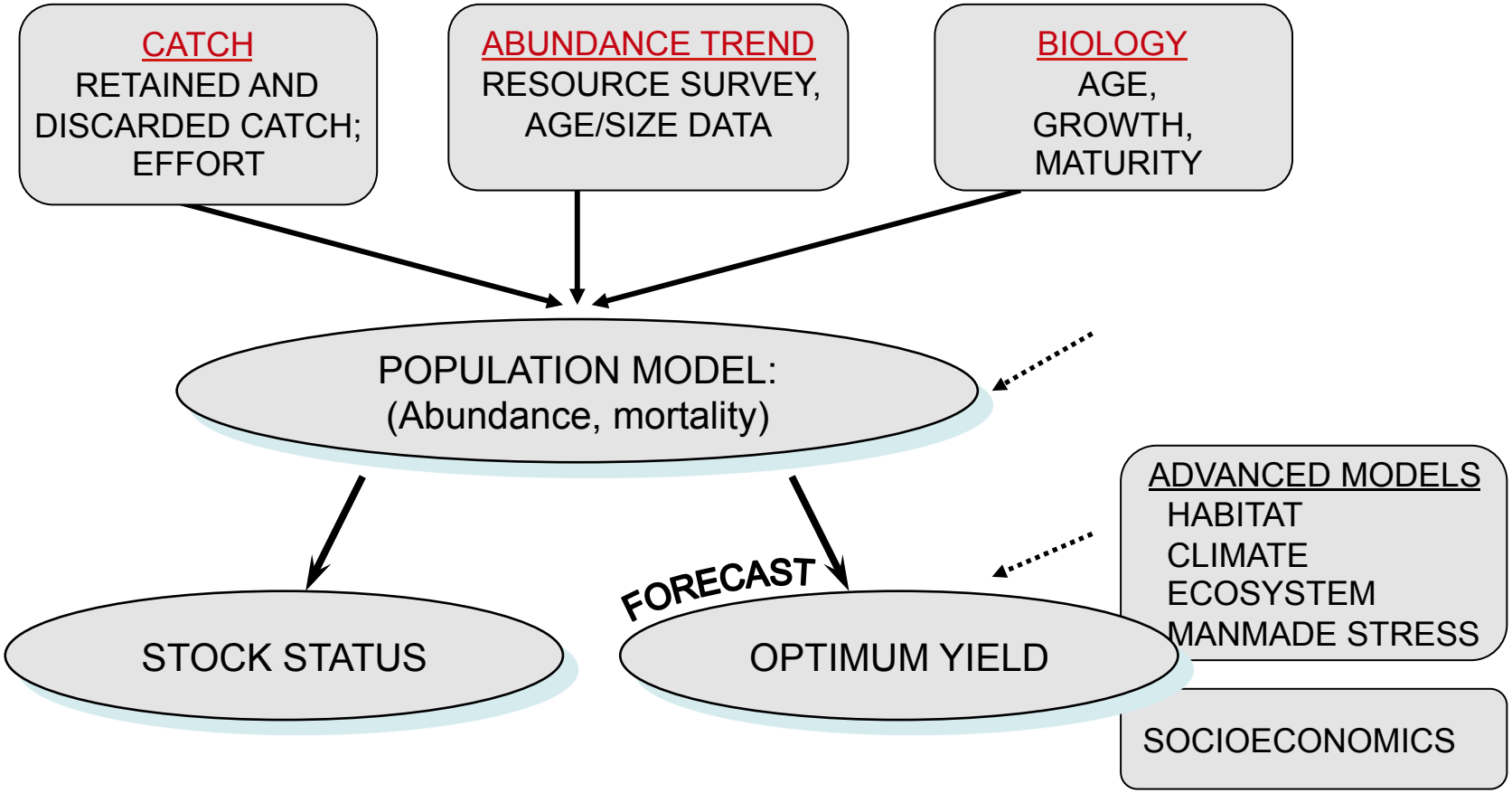
Goals

- Improve and expand existing data collections
- New data collections
- More efficient use of sea days
- For Missions
  - Stock Assessment
  - Habitat Assessment
  - Ecosystem Assessment

Requirements for Stock Assessments

GOAL: More frequent, more precise assessments for more stocks in more areas



Mission Requirements

In many cases mandated by legislation

- Magnuson-Stevens Sustainable Fisheries Act (MSA)
- Marine Mammal Protection Act (MMPA)
- Endangered Species Act (ESA)

Mission: Improve Fish Stock Assessments

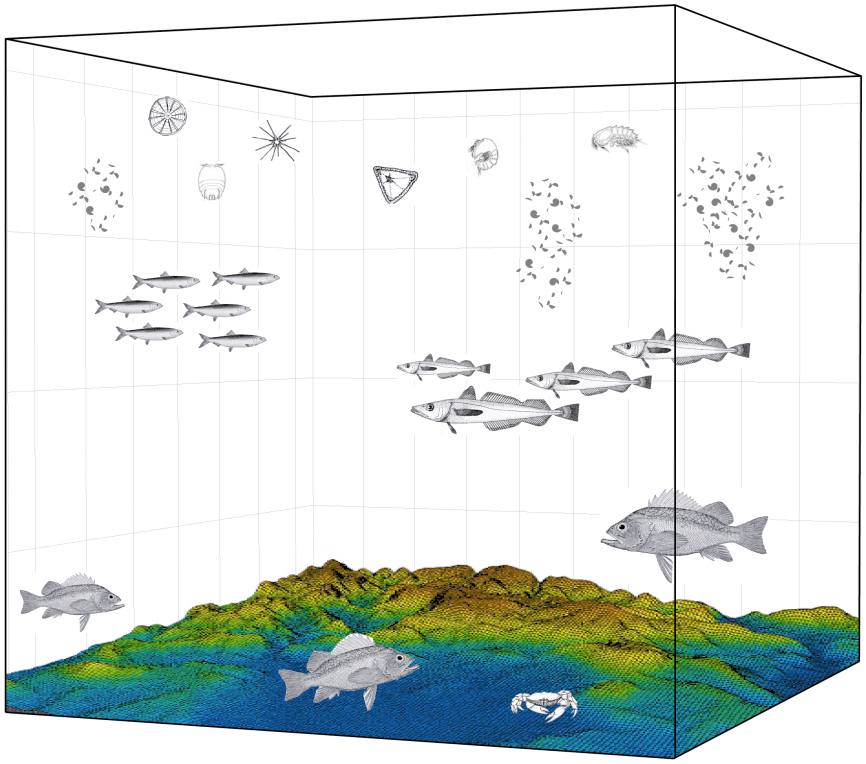
- Fish stock assessments are required for policy decisions to prevent overfishing and rebuild fisheries to sustainable resources.

- Approximately 47% of stock assessments are considered inadequate, and many of the data-limited assessments can be resolved with improvements in survey capabilities using innovative sampling technologies.

Need new tools for stock assessment:

- Improve efficiency
- Expand species and habitats monitored
- Improve precision of assessments

Ecosystem Monitoring



Legislation directs NOAA to monitor the status of many marine species – this in many cases includes monitoring the ecosystems that support them

For example:

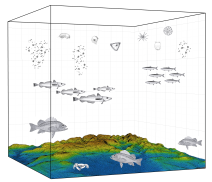
- Monitor effects of ocean acidification
- Importance of forage fish
- Predator prey interactions
- Anthropogenic impacts on habitat

Mission: Marine Ecosystem Assessment

- Synthesis of scientific information on relevant physical, chemical, ecological and human processes in relation to specified marine ecosystem management objectives.

- Understanding the effects of the physical environment and human impacts on the sustainability of living marine resources, production of marine ecosystems, and health of the oceans.

- Establish target levels and thresholds for important ecosystem components, and evaluate the impacts of management options and risks of not attaining target ecosystem states.



Mission: Protected Resource Assessment

- Information is needed in poorly sampled areas and for data poor species.
- Data is needed over a wide area and in difficult habitats



Mission: Habitat Science

- Habitat assessments are required to provide information on the function of habitats in relation to the production of living marine resources, protected species, and support of ecosystems.

- Technologies can provide enhanced sampling capabilities for estimating populations and characterizing their essential habitats

Technology Goals

- Improving the survey capabilities for more accurate, synoptic, and timely information.
- Enhance survey coverage, both spatially and temporally, without increasing expensive ship time.
- Resolving data-limited stock assessments in habitats that are inaccessible to conventional sampling gear.
- Improving the efficiency of data processing, such as automated optical image processing.
- Near real-time data processing and analyses between ship and shore-based laboratories.
- Integrated survey operations for ecosystem based management.

To improve utilization of advanced technologies

- Advanced sampling technology working group
  - Sensor technologies (e.g. acoustic, optical)
  - Alternative platforms (e.g. AUVs, towed systems, moorings)
  - Processing efficiencies (e.g. automated data processing and near real-time information)

Technologies can improve survey capabilities for assessing marine populations and their habitats.

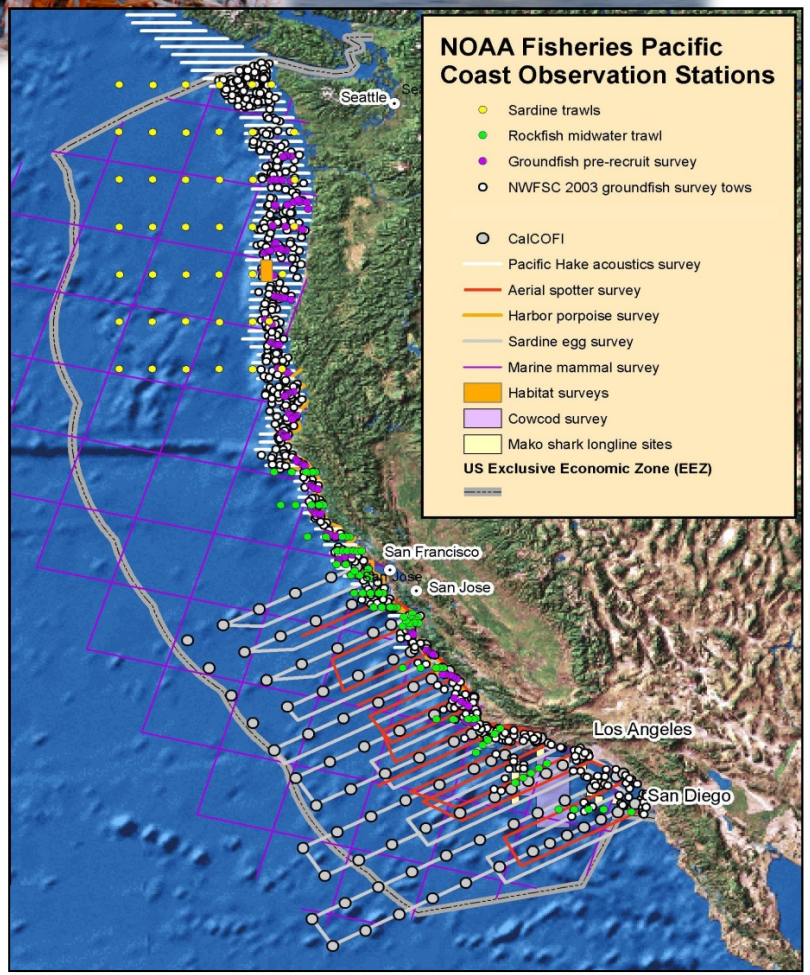
Current surveys:

•Strict operating procedures for both trawl and acoustic surveys (measurement and stretch of trawl warp, calibration of transducers etc.)

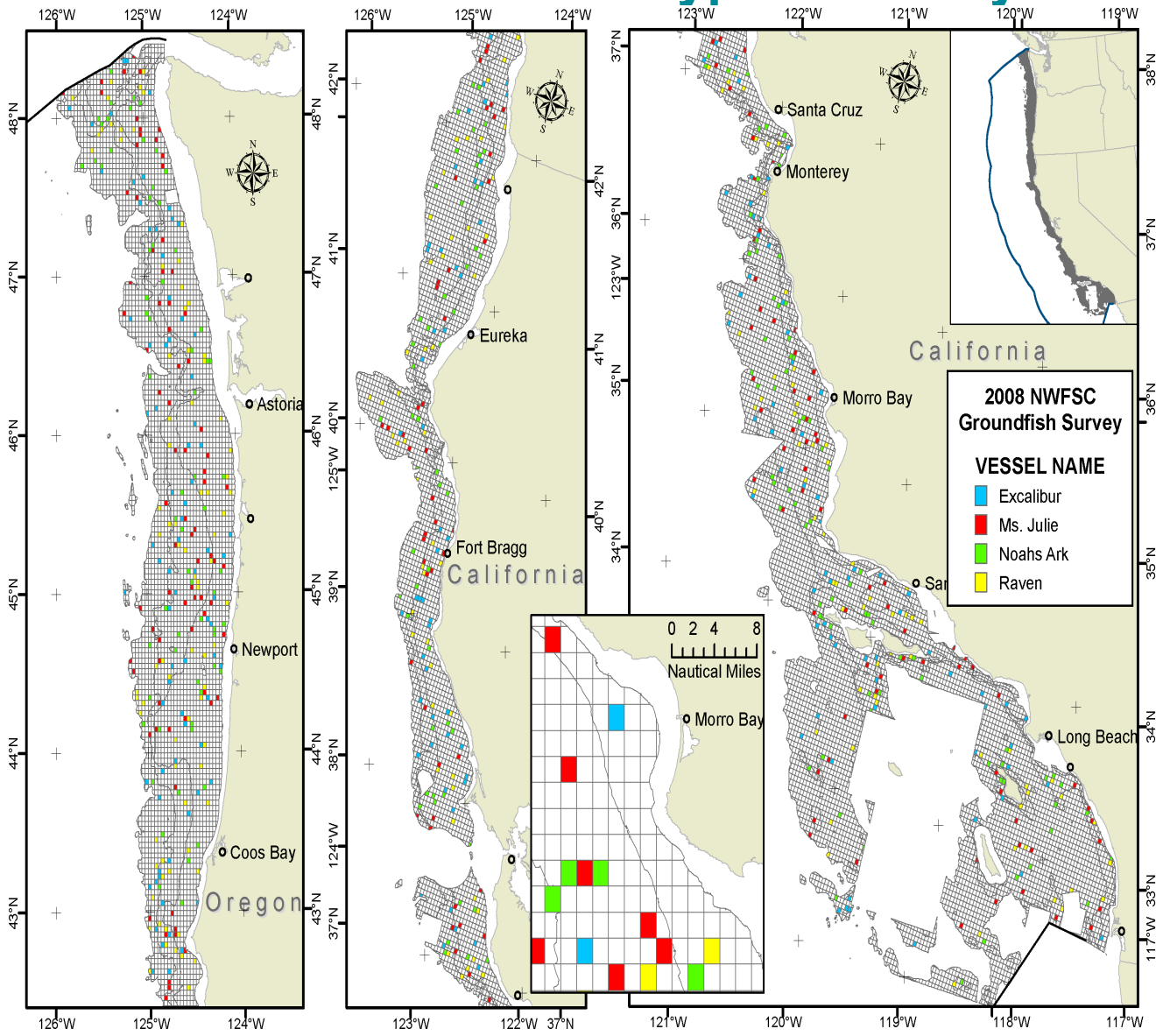
•Collected on a long term basis

•Hundreds of taxa identified

•Size of animals important



A Typical Survey



US Canadian border to US Mexican border

Survey area sub-divided into ~12,000 equally sized cells (1.5 X 2.0 nm)

Each of 4 charter vessels randomly assigned a set of 190 cells, secondary and tertiary cells also assigned

2 geographic strata: 80% N of Pt. Conception, 20% S

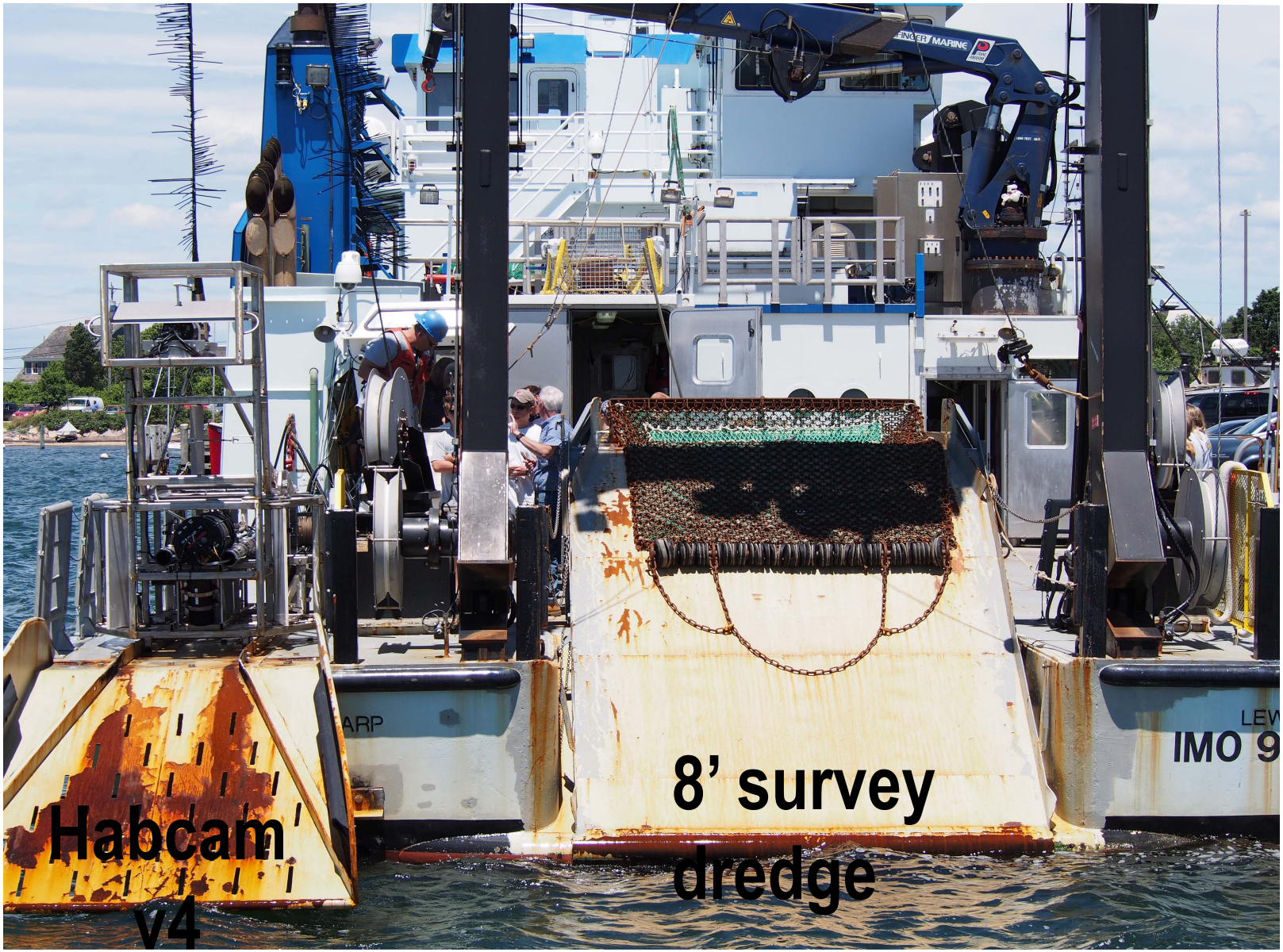
3 depth strata (55-183 m, 183-549 m; 550-1,280 m)

Minimum 30 tows/strata

Aberdeen Trawl

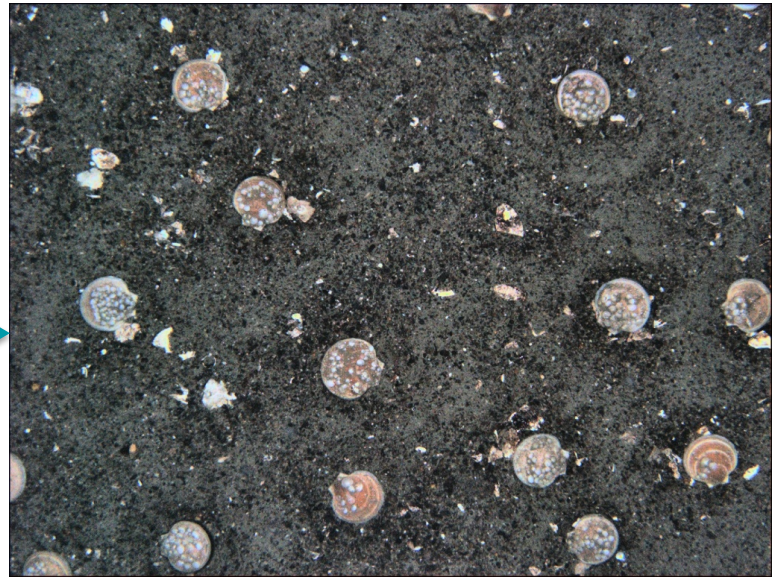
- Height 4.5 m; width 15 m
- Mesh 5.5 inches (1.5 inches in cod end)
- Headrope length 85 feet
- Footrope length: 104 feet
- Cookies 8-10 inch diameter
- Average area swept per tow 1.85 hectare or 0.2% of any given cell

Scallop Survey



Improvements

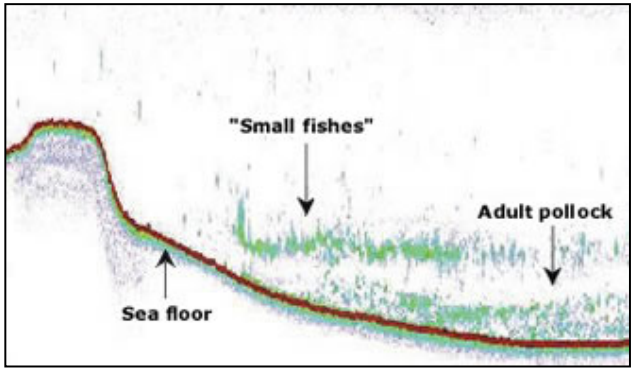
- More data on each ship day
- Low impact surveys for protected areas
- Additional environmental data
- New environments
- Better precision



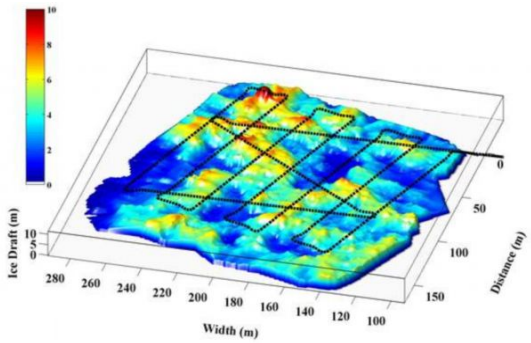
HabCam photos – Woods Hole Oceanographic

Improve Acoustic Surveys

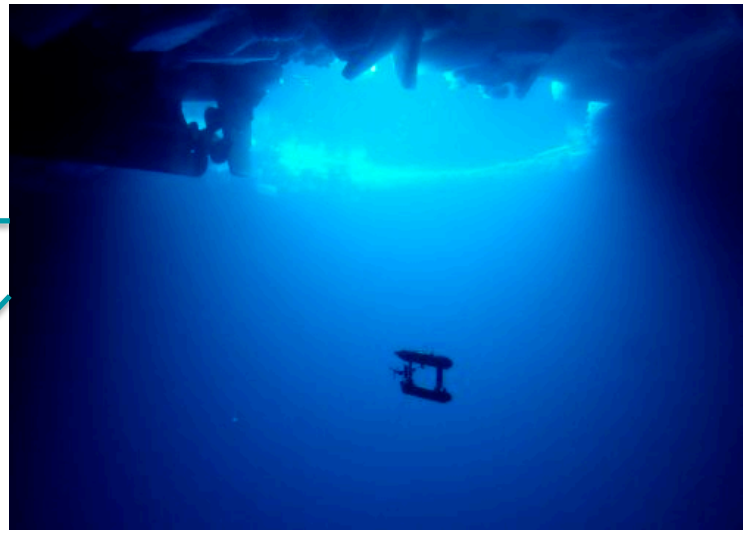
Acoustic remote sensing rapidly surveys large areas offering higher spatial resolution, and is non-intrusive but still need validation of species composition using nets.



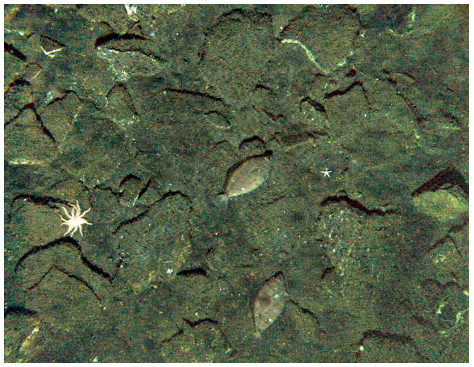
An Intriguing Example of AUV Innovation



3D Ice Measurement Antarctic

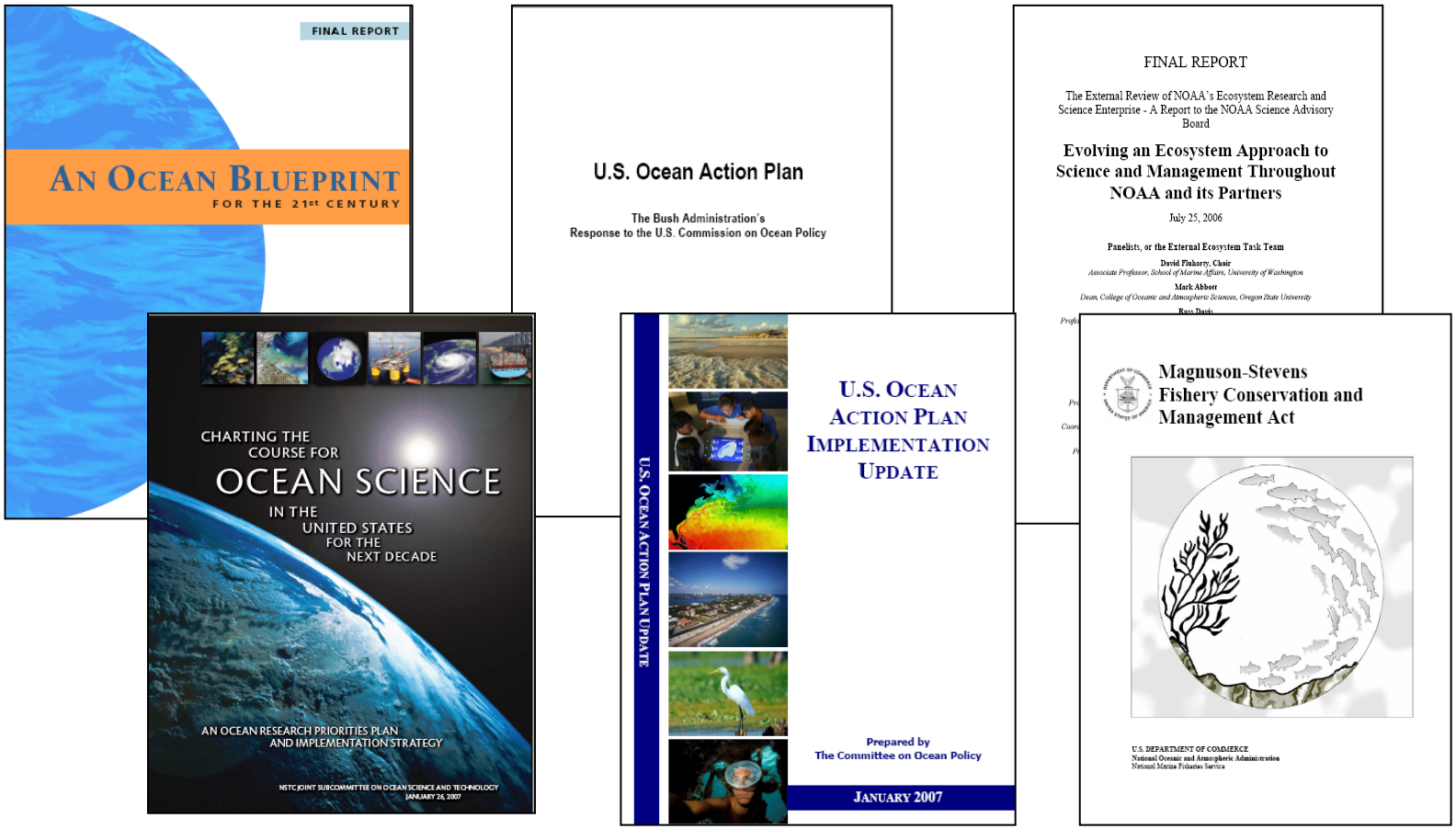


SeaBed AUV – Woods Hole Oceanographic



Seabed mapping on West Coast of US

Read more about it…


FINAL REPORT
AN OCEAN BLUEPRINT
FOR THE 21st CENTURY
U.S. Ocean Action Plan
The Bush Administration's
Response to the U.S. Commission on Ocean Policy
FINAL REPORT
The External Review of NOAA's Ecosystem Research and Science Enterprise - A Report to the NOAA Science Advisory Board
Evolving an Ecosystem Approach to Science and Management Throughout NOAA and its Partners
July 25, 2006
Panelists, or the External Ecosystem Task Team
David Fluharty, Chair
Associate Professor, School of Marine Affairs, University of Washington
Mark Abbott
Dean, College of Oceanic and Atmospheric Sciences, Oregon State University
CHARTING THE COURSE FOR
OCEAN SCIENCE
IN THE UNITED STATES FOR THE NEXT DECADE
AN OCEAN RESEARCH PRIORITIES PLAN AND IMPLEMENTATION STRATEGY
NSTC JOINT SUBCOMMITTEE ON OCEAN SCIENCE AND TECHNOLOGY
JANUARY 26, 2007
U.S. OCEAN ACTION PLAN UPDATE
U.S. OCEAN ACTION PLAN IMPLEMENTATION UPDATE
Prepared by
The Committee on Ocean Policy
JANUARY 2007
Magnuson-Stevens Fishery Conservation and Management Act
U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Read More About….

- http://www.st.nmfs.noaa.gov/st4/HabitatScience.html
- http://www.st.nmfs.noaa.gov/st4/OLOHabitat.html
- http://spo.nmfs.noaa.gov/olo6th-edition.htm
- http://www.nmfs.noaa.gov/msa2007/index.html